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AUTHOR Liang, Jersey
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ABSTRACT

This research aims to clarify the dimensionality of the Life Satisfaction Index A (LSIA). A multiple indicator structural equation model, which includes eleven items loading on three first-order factors and one second-order factor, is proposed to delineate the structure of LSIA. This model was empirically examined by using data from the 1974 NCOA-Harris survey, "Myths and Realities of Aging in America." The proposed model was supported and consistently replicated across four randomly divided subsamples. (Author)

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DIMENSIONS OF THE LIFE SATISFACTION INDEX A: A STRUCTURAL FORMULATION [1]

Jersey Liang, Ph.D.[2]

Running Head: Dimensions of LSIA

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ABSTRACT

This research aims to clarify the dimensionality of the Life Satisfaction Index A (LSIA). A multiple indicator structural equation model which includes eleven items loading on three first-order factors and one second-order factor is proposed to delineate the structure of LSIA. This model was empirically examined by using data from the 1974 NCOA-Harris survey, Myths and Realities of Aging in America. The proposed formulation is supported and consistently replicated across four randomly divided subsamples.

Key words: Psychological well-being; Measurement; Confirmatory factor analysis.

Subjective well-being has been among the oldest and most researched subjects in social gerontology. However, its conceptualization and measurement are not without controversy. In general, this construct has been operationalized in terms of life satisfaction, happiness, morale, and psychiatric symptoms. Relatively little is known about the structure of these measures, the relationships among them, and their links to the construct of subjective well-being.

A case in point is the Life Satisfaction Index A (LSIA) developed by Neugarten, Havighurst, and Tobin (1961). They viewed life satisfaction as having five dimensions: zest vs. apathy, resolution and fortitude, congruence between desired and achieved goals, positive self-concept, and mood tone. An individual is regarded as being at the positive end of the continuum of psychological well-being

> ...to the extent that he (a) takes pleasure from whatever the round of activities that constitutes his everyday life; (b) regards his life as meaningful and accepts resolutely that which life has been; (c) feels he has succeeded in achieving his major goals; (d) holds a positive image of self; and (e) maintains happy and optimistic attitudes and mood (Neugarten et al., 1961: 137)

Using a long-term time referent, the LSIA includes twenty items with which the respondents agree or disagree.

Research concerning the dimensionality of LSIA is by no means conclusive. Using data collected from 508 small-town elderly residents, Adams (1969) factor analyzed LSIA and suggested that two items (i.e., "Compared to other people my age, I've made a lot of foolish decisions in my life" and "I feel my age, but it does not bother me") should be excluded due to their poor

discriminating abilities, low item-total correlations, and low commonalities. With reference to the dimensionality of LSIA, Adams was somewhat inconsistent. On the basis of the unrotated factor solution, he suggested that "there is but one major factor associated with the LSIA items, presumably life satisfaction" (1969: 472). Using the rotated factor solution, he stated that "four factors are clearly discernible" (1969: 473) even though he was able to name only three of them. The three factors identified by Adams were mood tone, zest, and congruence. No factors of resolution and fortitude or self-esteem were found. What Adams didn't mention was that his rotated factor solution is but one of an infinite number of linear transformations of the unrotated solution (see Mulaik, 1972).

Several other investigators also factor analyzed LSIA or its shorter version (Bigot, 1974; Dobson et al., 1979). As pointed out by Lawton (1982), comparisons of these analyses are difficult due to the different item pools used by these investigators. Some convergence in factor definition was observed but only within very rough limits.

Using exploratory factor analysis, Hoyt and Creech (1983) recommended a three-factor, eight-item version of LSIA on the basis of its superior fit in different sex and racial groups. The three factors identified by them corresponded to the congruence, mood tone, and zest dimensions reported by Adams (1969). Furthermore on the basis of confirmatory factor analyses, they argued that the loadings of the LSIA items vary across different subgroups.

Two remarks can be made concerning previous efforts in assessing the structure of LSIA. First, most of the previous factor analyses of LSIA are descriptive in nature. Little attention has been directed to theoretical explanations of the relationships among the identified dimensions. Most studies stopped by concluding that LSIA consists of a set of interrelated

factors (Adams, 1969; Hoyt & Creech, 1983). No attempts have been made to explicate the underlying causal mechanism which accounts for the factor correlations. Even when LSIA is assumed to be multidimensional, the correlations among the dimensions and measurement errors involved have not been taken into account in estimating the impact of their determinants (Hoyt et al., 1980; Knapp, 1976).

Second, Pearson correlation coefficients of discrete measures were often used in previous factor analyses. These coefficients are generally biased estimates of the true correlations of the underlying continuous variables. Consequently, the application of factor analysis may lead to an incorrect number of factors and to biased estimates of factor loadings (Olsson, 1979). Under these circumstances if the underlying variables have a multivariate normal distribution, polychoric correlations--or in the case of dichotomous measures, tetrachoric correlations--are appropriate measures.

To alleviate these limitations, a model is proposed to delineate the structure of LSIA. This involves the application of analysis of covariance structures or LISREL (Jöreskog & Sörbom, 1978). Such a strategy calls for the construction of explicit structural equation models which relate the latent traits or unobserved constructs to their observed indicators. In particular, a second-order factor, subjective well-being, is hypothesized to account for the correlations among the three first-order dimensions. The proposed model was empirically evaluated by using data from the NCOA-Harris study, Myths and Realities of Aging in America (1975). Pearson correlations, covariances, and polychoric correlations were used to examine the proposed specification.

MODEL SPECIFICATION

Figure 1 presents a diagram of the proposed model describing the structure of LSIA (see footnote 1). Here, ξ_1 (ksi$_1$) refers to the second-

order factor; the η's (eta's) are the dimensions or the first-order factors. The γ's (gamma's) are structural coefficients or direct causal effects linking the latent variables, ξ_1 and η's. The y's signify the observable indicators for the three dimensions (η's). The λ's (lambda's) are the factor loadings or the coefficients of indicators regressed on the unobserved dimensions. To establish the unit of measurement for each first-order factor, the factor loading of one of its indicators is constrained to 1. The same practice was also applied to the second-order factor. Finally, the ε's (epsilon's) denote measurement errors associated with the observable indicators. These notations are in accordance with the LISREL conventions suggested by Jöreskog and Sörbom (1978).

<Figure 1 about here>

Before describing the proposed model in detail, it seems appropriate to outline the rationale for such a formulation. This model is specified to accomplish three objectives: (a) a clear interpretation of each dimension, (b) desirable measurement properties such as acceptable reliabilities and independent measurement errors, and (c) a parsimonious account of the correlations among the dimensions.

On the basis of conceptual concerns and previous empirical analyses, LSIA is assumed to include three first-order factors: (a) mood tone (η_1), (b) zest (η_2), and (c) congruence (η_3) (Figure 1). Mood tone (η_1) has three observable indicators (y_1 through y_3); zest (η_2) has four indicators (y_4 through y_7); and congruence (η_3) also involves four indicators (y_8 through y_{11}). The items associated with these three dimensions along with Adams' original specification are presented in Table 1.

<Table 1 about here>

These three first-order factors are specified in view of the fact that they have been repeatedly identified by previous investigators such as Adams (1969) and Hoyt and Creech (1983). Furthermore, there is a fair consensus concerning the conceptual meaning of these factors (Adams, 1969; George, 1981; Hoyt & Creech, 1983; Lawton, 1983; Neugarten et. al., 1961). In particular, mood tone (η_1) has been interpreted as representing happiness which is a positive affect or a cognitive assessment of positive affects. Zest (η_2) implies an optimistic and positive outlook of life at present and in the future as opposed to life in the past. Congruence (η_3) represents life satisfaction which is a cognitive assessment of the extent to which a person's life is in general satisfying, or the degree to which one has attained one's desired goals.

The proposed model, however, differs from previous factor solutions in several respects. These differences can be illustrated by comparing the proposed specification with Adams' (1969) solution (see Table 1). First, three instead of four first-order factors are assumed in this model. Due to its ambiguous conceptual meaning, the fourth factor, which Adams was unable to name, is excluded. Although Knapp (1976) and Hoyt et al. (1980) identified this factor as resolution and fortitude, they provided little theoretical rationale. Conceptually, it is also difficult to differentiate resolution from congruence. Furthermore, Hoyt and Creech (1983) recently recommended a three-factor solution consisting of mood tone, zest, and congruence.

Second, eleven items instead of the eighteen items used by Adams are included in the proposed model. The selection and assignment of these items to the three dimensions were based on three criteria: (a) face validity, (b) reliability, and (c) the pattern of correlated measurement errors. In

particular, each of the 18 items was examined to determine whether it is conceptually descriptive of the dimension to which it was assigned. In addition, in an exploratory analysis of a subsample, one-fourth of the total sample size, the reliabilities and the correlations among measurement errors in the observed indicators were evaluated. Reliability is defined as the amount of the true or common variance in proportion to the total variance (Alwin & Jackson, 1979). Items having less than 20% true variance or a standardized factor loading less than .45 were eliminated. This is based on the finding that the bias and inefficiency associated with estimates of structural parameters can be considerable when factor loadings or epistemic correlations are too small (Jacobson & Lalu, 1974). Furthermore, as correlations among measurement errors increase, the biases in the parameter estimates also rise (Jacobson & Lalu, 1974). This is especially true when indicators of a given factor have measurement errors correlated with those associated with indicators of a different factor. Correlated measurement errors can be detected by applying Sörbom's (1975) first derivative test in the context of confirmatory factor analysis. Costner and Schoenberg (1973) suggested that observed indicators with a pattern of complex correlated measurement errors may be eliminated to improve the goodness-of-fit of the specification. Although this practice may reduce the number of items for a given latent variable, three or four "well-behaved" indicators are preferable than many more "poor" indicators (Jacobson & Lalu, 1974; Kenny, 1979). Using these three criteria, the following revisions of Adams' solution were made.

While Adams employed six items in measuring the dimension of mood tone, only three items were retained in the proposed model (Table 1). One item, "Most of the things I do are monotonous," was reassigned to the zest dimension (η_2) on the basis of face validity. Two items, "This is the dreariest time of

my life" and "Compared to other people, I get down in the dumps too often," were removed due to their cross-construct correlated measurement errors.

Adams assigned six items to the dimension of zest (η_2) while only four items are included in the proposed model (Table 1). One item, "Compared to other people my age, I make a good appearance," is clearly an indicator of self-concept rather than zest and was therefore excluded. The item, "As I grow older, things seem better than I thought they would be," was removed because of its cross-construct correlated measurement error. Another item, "I have made plans for things I'll be doing a month or a year from now," was dropped due to its low factor loading (.348). As suggested previously, the item, "Most of the things I do are boring or monotonous," is included here because of its conceptual meaning or face validity.

While Adams included only three items as indicators of congruence (η_3), four items are used in the present specification. The additional item, "I have gotten more of the breaks in life than most people I know," is included because of its conceptual meaning. Another item, "When I think back over my life, I didn't get most of the important things I wanted," was initially assigned to congruence due to its face validity but was subsequently removed because of its cross-construct correlated measurement error.

It would be interesting to contrast the proposed model with the one suggested by Hoyt and Creech (1983) for the proposed model includes seven out of eight of their items. The item, "I have made plans for things I'll be doing a month or a year from now," was deleted due to its small factor loading (.348). The assignment of the remaining seven items to the three factors are identical for the proposed model and the Hoyt-Creech solution. However, it should be noted that criteria different from those used by Hoyt and Creech

were applied in this study. More discussion of this point will be presented later.

Finally, the proposed model aims to provide a parsimonious account for the correlation among the three dimensions and their links to subjective well-being. It has been generally recognized that the construct of subjective well-being consists of several components such as life satisfaction, happiness, affects, and psychiatric symptoms. These components should not be used interchangeably as if they were the same phenomena (George, 1981; Lawton, 1977). Given that the three proposed dimensions are distinct manifestations of subjective well-being, it would be sensible to hypothesize the correlations among these dimensions are due to their common dependence on a higher level construct, subjective well-being. Objections may be raised in that the correlations among the first-order factors may not be entirely accounted for by the second-order factor. However, one should not lose sight of the fact that the present model has been constructed on the principle of parsimony which underlies the substantive rotation criterion of a simple structure as outlined by Thurstone (1947). Furthermore, the usefulness or goodness-of-fit of such a specification can be empirically evaluated. However, the identification of the second-order factor as subjective well-being is based on theoretical grounds instead of statistical evidence.

Obviously, there may be manifestations of subjective well-being other than those included in the proposed model. Nevertheless, it should be noted that the proposed formulation aims to rationalize the structure of a given scale which may or may not encompass all facets of subjective well-being. Results from this analysis would contribute to a further understanding of the nature of subjective well-being.

Several empirical implications can be derived from the proposed model. First, the loadings (λ's) of the observed indicators (y's) on the first-order factors (η's) should all be greater than .45 and statistically significant. Second, the loadings (γ's) on the second-order factor shall all be greater than zero and statistically significant. This implies that the three first-order factors cannot be independent of one another. Otherwise, the existence of a second-order factor is not possible. Third, if the second-order factor is held constant, there will be no correlations among the three first-order dimensions. This is indicated by the absence of correlated residuals in equations (i.e., $cov(\zeta_i,\zeta_j)=0$, $i \neq j$). Fourth, specific assumptions about the nature of the measurement errors (ϵ_1 through ϵ_{11}) are needed to make the proposed model empirically testable. As shown in Figure 1, independence among measurement errors is assumed. Finally, the proposed model is a true-score model which differs from the common factor analysis models proposed by Adams (1969) and Hoyt and Creech (1983). The true-score model is more restrictive in which each indicator only loads on one factor whereas in a common factor analysis model each indicator loads on all latent factors.

METHODS

Data for this research came from the 1974 NCOA-Harris survey, Myths and Realities of Aging in America, which involved a national sample of 2,797 respondents aged 65 and over. A description of this study is contained in Louis Harris and Associates (1975). Since an oversampling of Black aged was involved in this study, the proportion is not representative of that in the general population. For the purpose of this study, both weighted and unweighted samples were analyzed. Little difference was found between results based these two samples. Consequently, only results based on the unweighted sample are included in this presentation.

To minimize capitalizing on chance, the analysis was systematically replicated (Finifter, 1972). First, the Harris survey was randomly divided into four subsamples. After excluding cases with missing data, the effective sample size ranged from 666 to 705. One subsample (N=666) was analyzed initially for the purpose of developing a model with an acceptable fit. The model was further replicated by using the other three subsamples.

Several assumptions are implied when LISREL is applied. First, given the proposed model the errors in the equations, ζ's, are assumed to be uncorrelated with the exogenous latent variable, ξ_1. Second, the measurement errors are assumed to be independent from ξ_1. Third, the observed indicators, are assumed to be multinormally distributed (Jöreskog & Sörbom, 1978). Under the assumptions outlined above, covariances and Pearson correlations in conjunction with the maximum likelihood procedure were used to estimate the parameters. In addition, polychoric correlations were used to derive the parameter estimates, since all observed indicators are discrete variables. Given that the multinormality assumption is often unrealistic, unweighted least-squares procedure was also used with Pearson and polychoric correlations to estimate the structural parameters (Jöreskog & Sörbom, 1981).

RESULTS

Table 2 presents the standardized maximum likelihood parameter estimates of the proposed model on the basis of Pearson correlations ("PRN") as well as polychoric correlations ("PLY"). Estimates based on Pearson correlations will be examined first. The empirical predictions derived from the proposed model are supported by observations from all four subsamples. In particular, loadings on the second-order factor, subjective well-being (ξ_1), by the first-order factors, mood tone (η_1), zest (η_2), and congruence (η_3), vary from .669 to .998; and are all statistically significant at the .05 level. The residual

variances in the three first-order dimensions range from .003 to .552. In other words, subjective well-being (ξ_1) explains between 45% and close to 100% of the variance in the three dimensions. In addition, zest (η_2) is the closest approximation to the second-order factor of subjective well-being (ξ_1) in that it has the smallest residual variance and none of its residual variance estimates is statistically significant at the .05 level.

All estimated loadings of the observed indicators (y_1 through y_{11}) are statistically significant at the .05 level. They are all greater than .45 except in two instances. Even in these cases, the loadings are very close to .45 (i.e., .432 and .444 in Subsample 2). Furthermore, measurement error variances range from .347 to .802. Assuming a classical true score model, the proportions of the true score variances in the observed indicators vary between .198 and .651. Despite some fluctuations, the unstandardized estimates of factor loadings and measurement error variances are in general relatively similar across the four subsamples (see Footnote 1).

Having examined the parameter estimates, the extent to which the proposed model fits the data needs to be addressed. Several measures of goodness-of-fit were used. The first is the likelihood ratio, with a χ^2 distribution, it assesses the probability that the observed covariance matrices could have been generated by the hypothesized model. According to this measure, the proposed specification does not fit the data very well. With 41 degrees of freedom, the probabilities range between 0 and .006.

It should be noted that the likelihood ratio test is very sensitive to sample size. For large samples, almost no theoretical structure will adequately account for the observed covariance matrix (Bentler & Bonett, 1980). Therefore, a more appropriate fit index would be one which is not affected by the sample size. The relative likelihood ratio, the ratio between

a χ^2 and its degrees of freedom, partially offsets the impact of sample size. Ratios in the neighborhood of 2 to 1 or 3 to 1 are considered indicative of an acceptable fit (Carmines and McIver, 1981). Applying this criterion the proposed model has a ratio between 1.648 and 2.584 indicating an adequate fit.

Another index of goodness-of-fit was developed by Bentler and Bonett (1980). With a range between 0 and 1, this index shows the improvement achieved by a proposed theoretical specification over the null model which assumes no causal linkages among the variables. Bentler and Bonett suggested that a model with an index value smaller than .9 can usually be substantially improved. As illustrated in Table 2, the Bentler-Bonett index for the proposed model ranges from .940 to .958 which is more than adequate.

The last two measures of goodness-of-fit were devised by Jöreskog and Sörbom (1981). One is the Goodness-of-Fit Index (GFI) and the other is the Adjusted Goodness-of-Fit Index (AGFI) which takes the degrees of freedom into account. With a value ranging between 0 and 1, GFI is a measure of the relative amount of variances and covariances jointly accounted for by the model. It is independent of the sample size and relatively robust against departures from normality. The GFI's of the proposed model vary from .967 to .978 and the AGFI's range between .947 and .965. That is, between 95% and 98% of the variances are explained by the proposed model.

LISREL was initially developed with the assumption that all variables are continuous. As in many other studies, this assumption is not fulfilled in the present research. Consequently, parameters of the proposed model were also estimated by using the polychoric correlation coefficients in conjunction with the maximum likelihood procedure. These estimates are listed under "PLY" in Table 2. No statistical significance tests and χ^2-likelihood ratios were obtained for the parameter estimates based on polychorics because they are

unlikely to behave like ordinary sample moments even asymptotically (Jöreskog and Sörbom, 1981).

Based on polychorics, the factor loadings are in most cases greater than their counterparts based on Pearsonian correlations. Since polychorics are generally larger than the Pearsonian counterparts, the estimates of measurement error variances (θ_ϵ's) are consequently smaller than those based on Pearson correlations. On the other hand, polychorics yield lower estimates of γ_2, Ψ_{11}, and Ψ_{33} and generates higher estimates of γ_1, γ_3, and Ψ_{22}, when comparing with the results based on Pearson correlations. Although there are some differences between the estimates yielded by Pearson correlations and those derived from polychorics, these differences are not very substantial. According to the GFI's and AGFI's based on polychorics, from 81% to 94% of the variances is accounted for by the proposed model which are a bit lower than their Pearsonian counterparts. This may be due to the unrealistic assumption of multinormality of the observable indicators.

To examine the biases which may be caused by assuming a multinormal distribution of the observed variables, parameter estimates were also obtained by using unweighted least squares with Pearson as well as polychoric correlations. No substantial differences were found between the maximum likelihood and the unweighted least squares estimates. The goodness-of-fit measures based on unweighted least squares are a little higher than those generated by the maximum likelihood method. Most interestingly, there is virtually no difference in GFI's and AGFI's derived from Pearson and polychoric correlations (see Footnote 1).

DISCUSSION

This study proposes a structural formulation to account for the correlations among the three first-order dimensions of LSIA including mood

tone, zest, and congruence. It was developed by selecting eleven out of eighteen LSIA items according to criteria such as face validity, reliability, and the pattern of correlated measurement errors. The hypothesis that a second-order factor, subjective well-being, causes such correlations is consistently supported by results from all four subsamples.

Using the same data set, Hoyt and Creech (1983) recently conducted exploratory and confirmatory factor analyses of LSIA and recommended a three-factor, eight-item solution. It would be instructive to compare their analysis with the present one. Hoyt and Creech developed their model by using exploratory factor analysis and by evaluating the likelihood ratios of this model within four different gender and racial groups. In the present study, one second-order factor and three first-order dimensions were specified on conceptual as well as empirical basis. Criteria such as face validity, reliability, and the pattern of correlated measurement errors were used to assign observed indicators to the latent factors. Given that different criteria were used in both studies, it is not surprising that a somewhat different model has emerged from the present analysis. One should note, however, that even with four fewer items the Hoyt-Creech solution is similar to the present analysis in terms of item assignments to the three identified factors.

Due to the inclusion of different items and dissimilar theoretical specifications, a direct comparison between the Hoyt-Creech model and the present analysis is difficult if not impossible. Suffice it to say that the proposed model seems more parsimonious and heuristic. In particular, the present model assumes a relatively simple factor structure in that each indicator is postulated to have a factor complexity of one while Hoyt and Creech assumed a factor complexity of three. In addition, the correlations

among the three first-order dimensions were not explained in the Hoyt-Creech solution whereas in the present analysis a second-order factor seems to provide a plausible interpretation for the factor correlations.

Although this study has further clarified the structure of LSIA, many issues need to be addressed. First, one needs to ask the question: How valid is LSIA a measure of life satisfaction or more broadly, subjective well-being? The answer depends on one's definition of life satisfaction. Life satisfaction has been defined at least in two different ways. As mentioned earlier in this paper, Neugarten and her associates (1961) defined life satisfaction as consisting of five interrelated dimensions including zest (vs. apathy), resolution and fortitude, congruence, positive self-concept, and mood tone. According to this definition, LSIA clearly does not meet the criterion of conceptual validity in that factors such as positive self-concept and fortitude did not emerge from the many empirical analyses including the present one. Consequently, as stated by Hoyt and Creech (1983), the theoretical dimensions of life satisfaction postulated by Neugarten and her associates do not correspond well with the empirical results.

Although only three factors have been identified from the eighteen LSIA items, this does not necessarily negate the existence of factors such as positive self-concept and fortitude. The failure of researchers to identify these two factors so far can very well be because a sufficient number of good, observed indicators of these two dimensions were never included in the LSIA to begin with. Conceivably, such indicators can be incorporated into LSIA in the future. Assuming that these two factors do exist, it would be interesting to find out whether the argument of a second-order factor still holds.

Many researchers, notably George (1981) and Lawton (1977, 1983), prefer a more restrictive definition of life satisfaction. According to them, life

satisfaction refers to a cognitive assessment of how satisfying one's life is in general. Specifically, it is the congruence between the attained and desired goals. With this interpretation, LSIA clearly measures more than just life satisfaction because it also contains components such as happiness and zest or age-related morale (George, 1981; Lawton, 1977).

How does LSIA fare as a measure of subjective well-being? To address this issue, one has to outline it, conceptual properties first. Lawton (1977, 1983) and George (1981) presented perhaps the most comprehensive reviews of the conceptualization of subjective well-being. It was suggested that subjective well-being encompasses cognitive and affective components with various time referents which cannot be interpreted as if they were the same phenomena and used interchangeably. For instance, in addition to life satisfaction and happiness Lawton (1983) also included neuroticism or negative affect and positive affect as dimensions of psychological well- being. Whereas LSIA does contain components such as life satisfaction (i.e., congruence) and happiness (i.e., mood tone), the factor of zest represents essentially an affect without a specific time frame. Consequently, one may conclude that LSIA is an incomplete measure of subjective well-being in that it does not measure transitory affects.

However, according to a recent study published by Carp and Carp (1983) such transitory affects may be tapped by items loading on the zest factor. Briefly, Carp and Carp factor analyzed a number of measures of subjective well-being. Among them are LSIA and the Affect Balance Scale (ABS) developed by Bradburn (1969). They found that two zest items, "Most of the things I do are boring or monotonous" (y_7) and "I feel old and sometimes tired" (y_6) clustered on a factor along with the negative transitory affect items of ABS. In addition, one zest item "I expect some interesting and pleasant things to

happen to me in the future" (y_4) was revealed to load on the same dimension with five ABS positive affect items. Despite such empirical results, one must be cautious in accepting zest as a factor of transitory affect. This is because conceptually the transitory nature of the zest items is simply not very clear. That is, the criterion of face validity cannot be fulfilled.

There are other ambiguities concerning the nature of the LSIA dimensions. For example, while George (1981) considered mood tone or happiness as being a transitory affect, Lawton (1977) saw it as a cognitive assessment with a long term perspective. Hoyt and Creech (1983) simply interpreted mood tone as satisfaction with the present in comparison with past adjustment. On the other hand, George (1981) described zest to be an affect with a long-term referent. In contrast, Lawton (1977) conceptualized this factor as something similar to "age-related morale" which is a cognitive assessment. These inconsistencies may be a function of the ambiguous meanings associated with the LSIA items which were not developed along explicit cognitive and affective dimensions.

Given the above observations, future research should aim at the explicit specifications of the nature and structure of subjective well-being. In particular, one should not only clarify the conceptual meanings of all dimensions of subjective well-being but also specify how these dimensions are structurally interrelated to one another. Only when such issues are resolved, one can devise items or observable indicators to tap each conceptual dimension and to generate a more refined and hopefully an adequate measure of subjective well-being. To make LSIA a better measure of subjective well-being, items measuring transitory affects should be incorporated. For instance, LSIA can be used in conjunction with measures of transitory affects such as the Affect Balance Scale.

Finally, several cautionary notes should be taken in interpreting the results. Although the proposed model has been empirically supported and consistently replicated, factor invariance across different groups in terms of age, sex, and, race still remains to be established. This will further extend the generalizability of the proposed model or uncover possible variations in the factor pattern. In addition, it is possible that other specifications may fit the data equally well or better. In such an event, a crucial test of the competing models is needed.

FOOTNOTES

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[2]Institute of Gerontology, Wayne State University, Detroit, Michigan 48202.

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Figure 1. Path Diagram for the Proposed Structure of LSIA

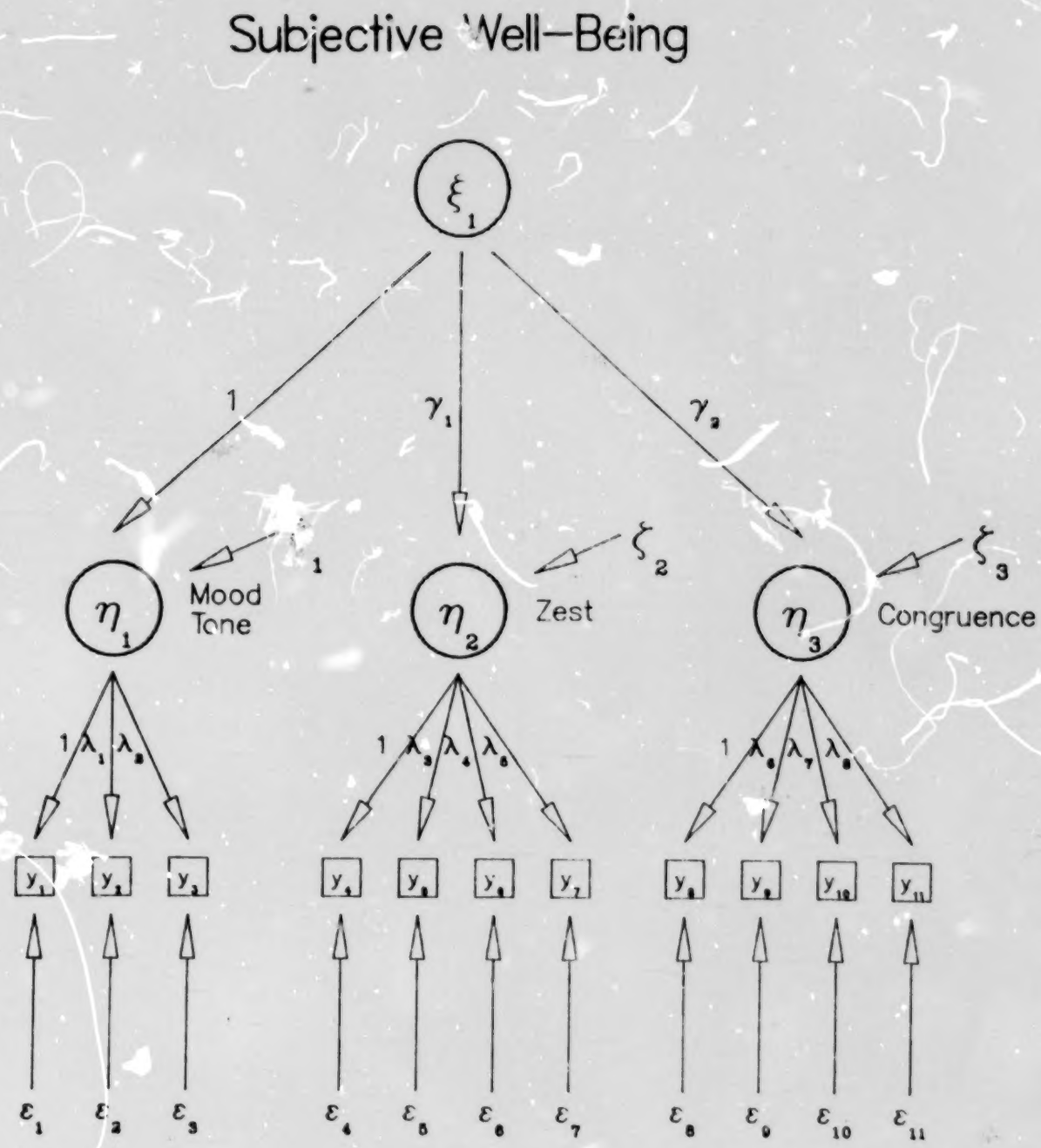

Table 1. A Comparison Between Adams' Solution and the Proposed Model[a]

Items	Models	
	Adams	Liang
Mood Tone		
This is the dreariest time of my life (3)	+	-d
I am just as happy as when I was younger (4)	+	+
My life could be happier than it is now (5)	+	+
These are the best years of my life (6)	+	+
Most of the things I do are boring or monotonous (7)	+	-b
Compared to other people, I get down in the dumps too often (18)	+	-d
Zest for Life		
As I grow older, things seem better than I thought they would be (1)	+	-d
I expect some interesting and pleasant things to happen to me in the future (8)	+	+
The things I do are as interesting to me as they ever were (9)	+	+
I feel old and sometimes tired (10)	+	+
Compared to other people my age, I make a good appearance (15)	+	-b
I have made plans for things I'll be doing a month or a year from now (16)	+	-c

Table 1 (Continued). A Comparison Between Adams' Solution and the Proposed Model[a]

Items	Models	
Most of the things I do are boring or montonous (7)	-	+[e]
Congruence		
As I look on my life, I am fairly well satisfied (12)	+	+
I would not change my past life even if I could (13)	+	+
I have gotten pretty much what I expected out of life (19)	+	+
I have gotten more of the breaks in life than most of the people I know (2)	-	+[e]
When I think back over my life, I didn't get most of the important things I wanted (17)	-	-[e,d]
Unnamed Factor		
I have gotten more of the breaks in life than most of the people I know (2)	+	-
When I think back over my life, I didn't get most of the important things I wanted (17)	+	-
In spite of what people say, th lot of the average man is getting worse (20)	+	-

[a] A plus (+) sign denotes inclusion while a minus (-) sign refers exclusion. The parenthesized numbers at the end of each item are the original item numbers.

[b] Exclusion due to the lack of face validity.

[c] Exclusion due to a large amount of measurement error (i.e., standardized factor loading < .45).

[d] Exclusion due to its complex pattern of correlated measurement errors, e.g., cross-construct correlated measurement errors.

[e] Inclusion due to face validity.

Table 2. Standardized Maximum Likelihood LISREL Estimates [1]

Description	Subsample 1 (N=666)		Subsample 2 (N=669)		Subsample 3 (N=684)		Subsample 4 (N=705)	
	PRN	PLY	PRN	PLY	PRN	PLY	PRN	PLY
Factor Loadings on the Second-Order Factor (γ's)								
Mood tone	.812	.852	.817	.873	.860	.919	.827	.906
Zest for life	.989	.985	.998	.998	.983	.973	.997	.963
Congruence	.680	.723	.718	.763	.669	.713	.708	.772
Error Variances in Equations (ζ's)								
Mood tone	.340	.275	.332	.238	.260	.155	.315	.179
Zest for life	.022*	.030	.003*	.003	.033*	.053	.006*	.065
Congruence	.538	.478	.484	.418	.552	.491	.499	.403
Factor Loadings on the First-Order Factor (λ's)								
Mood Tone								
I am just as happy as when I was younger (4)	.793	.931	.807	.929	.790	.911	.750	.87
My life could be happier than it is now (5)	.550	.647	.499	.605	.454	.556	.557	.66
These are the best years of my life (6)	.656	.811	.553	.709	.632	.777	.670	.81
Zest for Life								
I expect some interesting and pleasant things to happen to me in the future (8)	.496	.580	.484	.575	.473	.564	.529	.63
The things I do are as interesting to me as they ever were (9)	.689	.835	.727	.855	.675	.831	.695	.83
I feel old and sometimes tired (10)	.556	.635	.432	.559	.483	.598	.461	.58
Most of the things I do are boring or monotonous (7)	.576	.749	.620	.813	.551	.753	.551	.71
Congruence								
As I look on my life, I am fairly well satisfied (12)	.654	.877	.623	.826	.667	.866	.683	.89
I would not change my past life even if I could (13)	.495	.659	.444	.587	.569	.712	.518	.67

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Table 2. Standardized LISREL Estimates [1]

Vars	Description	Subsample 1 (N=666)		Subsample 2 (N=669)		Subsample 3 (N=684)		Subsample 4 (N=705)	
		PRN	PLY	PRN	PLY	PRN	PLY	PRN	PLY
	Factor Loadings on the Second-Order Factor (γ's)								
η_1	Mood tone	.812	.863	.817	.884	.860	.924	.827	.896
η_2	Zest for life	.989	.958	.998	.971	.983	.955	.997	.960
η_3	Congruence	.680	.730	.718	.764	.669	.724	.708	.768
	Error Variances in Equations (ψ's)								
η_1	Mood tone	.340	.255	.332	.219	.260	.146	.315	.197
η_2	Zest for life	.022*	.088	.003*	.058	.033*	.088	.006*	.079
η_3	Congruence	.538	.468	.484	.416	.552	.476	.499	.411
	Factor Loadings on the First-Order Factor (λ's)								
η_1	Mood Tone								
y_1	I am just as happy as when I was younger (4)	.793	.928	.807	.917	.790	.908	.750	.891
y_2	My life could be happier than it is now (5)	.550	.685	.499	.639	.454	.573	.557	.646
y_3	These are the best years of my life (6)	.656	.785	.559	.680	.632	.774	.670	.823
η_2	Zest for Life								
y_4	I expect some interesting and pleasant things to happen to me in the future (8)	.496	.592	.484	.558	.473	.557	.529	.619
y_5	The things I do are as interesting to me as they ever were (9)	.689	.847	.727	.877	.675	.827	.695	.851
y_6	I feel old and sometimes tired (10)	.556	.691	.432	.543	.483	.617	.461	.580
y_7	Most of the things I do are boring or monotonous (7)	.576	.747	.620	.833	.561	.762	.551	.733
η_3	Congruence								
y_8	As I look on my life, I am fairly well satisfied (12)	.654	.883	.623	.842	.667	.852	.683	.903
y_9	I would not change my past life even if I could (13)	.495	.588	.444	.530	.569	.708	.518	.631

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Vars	Description	Subsample 1 (N=666)		Subsample 2 (N=669)		Subsample 3 (N=684)		Subsample 4 (N=705)	
		PRN	PLY	PRN	PLY	PRN	PLY	PRN	PLY
Y_{10}	I've gotten pretty much what I expected out of life (19)	.648	.797	.702	.859	.680	.840	.700	.839
Y_{11}	I have gotten more of the breaks in life than most of the people I know (2)	.497	.604	.608	.731	.486	.604	.506	.613
	Measurement Errors (θ_i's)								
Y_1	I am just as happy as when I was younger (4)	.370	.134	.349	.156	.375	.170	.438	.238
Y_2	My life could be happier than it is now (5)	.698	.581	.751	.634	.794	.690	.689	.559
Y_3	These are the best years of my life (6)	.569	.341	.687	.498	.601	.396	.551	.336
Y_4	I expect some interesting and pleasant things to happen to me in the future (8)	.754	.664	.766	.670	.777	.682	.720	.602
Y_5	The things I do are as interesting to me as they ever were (9)	.525	.303	.472	.269	.544	.310	.517	.308
Y_6	I feel old and sometimes tired (10)	.691	.517	.814	.687	.767	.642	.787	.663
Y_7	Most of the things I do are boring or monotonous (7)	.669	.438	.616	.340	.686	.433	.697	.484
Y_8	As I look on my life, I am fairly well satisfied (12)	.579	.231	.612	.317	.556	.249	.533	.192
Y_9	I would not change my past life even if I could (13)	.755	.565	.802	.655	.676	.492	.731	.540
Y_{10}	I've gotten pretty much what I expected out of life (19)	.580	.364	.508	.262	.538	.294	.510	.295
Y_{11}	I have gotten more of the breaks in life than most of the people I know (2)	.753	.635	.631	.466	.764	.635	.744	.625
	Likelihood Ratio/(χ^2)	67.581		76.423		75.094		105.942	
	Degrees of Freedom (D.F.)	41		41		41		41	
	Probability	.006		.001		.001		.000	
	Relative Likelihood Ratios (χ^2/D.F.)	1.648		1.864		1.832		2.584	
	Bentler-Bonett Fit Index	.958		.953		.952		.940	
	Goodness-of-Fit Index (GFI)	.978	.912	.976	.917	.976	.940	.967	.884
	Adjusted GFI	.965	.858	.961	.867	.962	.903	.947	.814

[1] All estimates based on Pearson correlations are significant at the .05 level except those marked by * which signifies a probability level greater than .05. No significance tests were performed on estimates based on polychorics.

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Table 2 (Continued). Standardized LISREL Estimates

Vars	Description	Subsample 1 (N=666)		Subsample 2 (N=[illegible]9)		Subsample 3 (N=684)		Subsample 4 (N=705)	
		PRN	PLY	PRN	PLY	PRN	PLY	PRN	PLY
y_{10}	I've gotten pretty much what I expected out of life (19)	.648	.807	.702	.857	.680	.832	.700	.819
y_{11}	I have gotten more of the breaks in life than most of the people I know (2)	.497	.652	.608	.767	.486	.633	.506	.664
	Measurement Errors (θ_ϵ's)								
y_1	I am just as happy as when I was younger (4)	.370	.139	.349	.159	.375	.1[illegible]	.438	.207
y_2	My life could be happier than it is now (5)	.698	.530	.751	.592	.794	.671	.689	.582
y_3	These are the best years of my life (6)	.569	.384	.687	.538	.601	.400	.551	.323
y_4	I expect some interesting and pleasant things to happen to me in the future (8)	.754	.650	.766	.688	.777	.690	.720	.617
y_5	The things I do are as interesting to me as they ever were (9)	.525	.282	.472	.232	.544	.316	.517	.276
y_6	I feel old and sometimes tired (10)	.691	.522	.814	.705	.767	.620	.787	.664
y_7	Most of the things I do are boring or monotonous (7)	.669	.441	.616	.307	.686	.420	.697	.462
y_8	As I look on my life, I am fairly well satisfied (12)	.579	.220	.612	.291	.556	.274	.533	.185
y_9	I would not change my past life even if I could (13)	.755	.654	.802	.719	.676	.499	.731	.601
y_{10}	I've gotten pretty much what I expected out of life (19)	.580	.348	.508	.266	.538	.308	.510	.328
y_{11}	I have gotten more of the breaks in life than most of the people I know (2)	.753	.574	.631	.441	.764	.600	.744	.560
	Likelihood Ratio/(χ^2)	67.581		76.423		75.094		105.942	
	Degrees of Freedom (D.F.)	41		41		41		41	
	Probability	.006		.001		.001		.000	
	Relative Likelihood Ratios (χ^2/D.F.)	1.648		1.864		1.832		2.584	
	Bentler-Bonett Fit Index	.958		.953		.952		.940	
	Goodness-of-Fit Index (GFI)	.978	.994	.976	.992	.976	.995	.967	.991
	Adjusted GFI	.965	.990	.961	.986	.962	.992	.947	.986

[1] All estimates are significant at the .05 level except those marked by * which signifies a probability level greater than .05.

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(NOT FOR PUBLICATION)

Appendix A

for

DIMENSIONS OF THE LIFE SATISFACTION INDEX A: A STRUCTURAL FORMULATION [1]

Jersey Liang, Ph.D.

Institute of Gerontology
Wayne State University
Detroit, Michigan 48202

[1] The attached tables are included only for the purpose of review. Due to their length, it is suggested that they not to be published. However, they will be made available to readers upon request.

TABLE A1

Structural Equations for the Life Satisfaction Index A

$$\underset{3\times 3}{\beta}\ \underset{3\times 1}{\eta} = \underset{3\times 1}{\Gamma}\ \underset{1\times 1}{\xi} + \underset{3\times 1}{\zeta} \qquad \text{(Equation 1)}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} = \begin{bmatrix} \gamma_1 \\ \gamma_2 \\ \gamma_3 \end{bmatrix} \begin{bmatrix} \xi_1 \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \end{bmatrix}$$

$$\underset{11\times 1}{y} = \underset{11\times 3}{\Lambda_y}\ \underset{3\times 1}{\eta} + \underset{11\times 1}{\varepsilon} \qquad \text{(Equation 2)}$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \\ y_7 \\ y_8 \\ y_9 \\ y_{10} \\ y_{11} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ \lambda_1 & 0 & 0 \\ \lambda_2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & \lambda_3 & 0 \\ 0 & \lambda_4 & 0 \\ 0 & \lambda_5 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & \lambda_6 \\ 0 & 0 & \lambda_7 \\ 0 & 0 & \lambda_8 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \\ \varepsilon_9 \\ \varepsilon_{10} \\ \varepsilon_{11} \end{bmatrix}$$

TABLE A1 (continued)

$$\underset{1\times1}{\Phi} = \underset{1\times1}{\xi}\ \underset{1\times1}{\xi'} = \left[\Phi_{11}\right] \qquad \text{(Equation 3)}$$

$$\underset{3\times3}{\Psi} = \underset{3\times1}{\zeta}\ \underset{1\times3}{\zeta'} = \text{Diag}\left[\Psi_{11}\ \ \Psi_{22}\ \ \Psi_{33}\right] \qquad \text{(Equation 4)}$$

$$\underset{11\times11}{\Theta_{\varepsilon}} = \underset{11\times1}{\varepsilon}\ \underset{1\times11}{\varepsilon'} = \text{Diag}\left[\theta_{11}\ \ \theta_{22}\ \ \theta_{33}\ \ .\ .\ .\ \theta_{11,11}\right] \qquad \text{(Equation 5)}$$

Table A2. Unstandardized LISREL Estimates [1]

Vars	Description	Subsample 1 (N=666)	Subsample 2 (N=669)	Subsample 3 (N=684)	Subsample (N=705)
	Factor Loadings on the Second-Order Factor (γ's)				
η_1	Mood tone	1.000+	1.000+	1.000+	1.000+
η_2	Zest for life	.675	.643	.609	.769
η_3	Congruence	.450	.451	.456	.528
	Error Variances in Equations (ψ's)				
η_1	Mood tone	.201	.199	.153	.168
η_2	Zest for life	.004*	.000*	.005*	.001*
η_3	Congruence	.082	.076	.111	.101
	Factor Loadings on the First-Order Factor (λ's)				
η_1	Mood Tone				
y_1	I am just as happy as when I was younger (4)	1.000+	1.000+	1.000+	1.000+
y_2	My life could be happier than it is now (5)	.683	.616	.567	.719
y_3	These are the best years of my life (6)	.782	.651	.756	.832
η_2	Zest for Life				
y_4	I expect some interesting and pleasant things to happen to me in the future (8)	1.000+	1.000+	1.000+	1.000+
y_5	The things I do are as interesting to me as they ever were (9)	1.468	1.537	1.438	1.332
y_6	I feel old and sometimes tired (10)	1.277	1.036	1.156	0.966
y_7	Most of the things I do are boring or monotonous (7)	.994	1.140	1.000	.914
η_3	Congruence				
y_8	As I look on my life, I am fairly well satisfied (12)	1.000+	1.000+	1.000+	1.000+
y_9	I would not change my past life even if I could (13)	1.066	1.015	1.144	1.044

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Table A2 (Continued). Unstandardized LISREL Estimates

Vars	Description	Subsample 1 (N=666)	Subsample 2 (N=669)	Subsample 3 (N=684)	Subsample 4 (N=705)
y_{10}	I've gotten pretty much what I expected out of life (19)	1.067	1.211	1.102	1.096
y_{11}	I have gotten more of the breaks in life than most of the people I know (2)	1.063	1.354	950	1.002
	Measurement Errors (θ_ε's)				
y_1	I am just as happy as when I was younger (4)	.347	.321	.354	.415
y_2	My life could be happier than it is now (5)	.637	.685	.731	.611
y_3	These are the best years of my life (6)	.477	.558	.507	.453
y_4	I expect some interesting and pleasant things to happen to me in the future (8)	.556	.542	.581	.556
y_5	The things I do are as interesting to me as they ever were (9)	.433	.349	.412	.411
y_6	I feel old and sometimes tired (10)	.661	.776	.734	.748
y_7	Most of the things I do are boring or monotonous (7)	.361	.345	.365	.416
y_8	As I look on my life, I am fairly well satisfied (12)	.229	.249	.252	.232
y_9	I would not change my past life even if I could (13)	.598	.659	.551	.603
y_{10}	I've gotten pretty much what I expected out of life (19)	.269	.238	.285	.284
y_{11}	I have gotten more of the breaks in life than most of the people I know (2)	.590	.493	.590	.592

[1] All estimates are significant at the .05 level except the constrained parameters (marked by +) and those marked by * which signifies a probability level greater than .05.

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